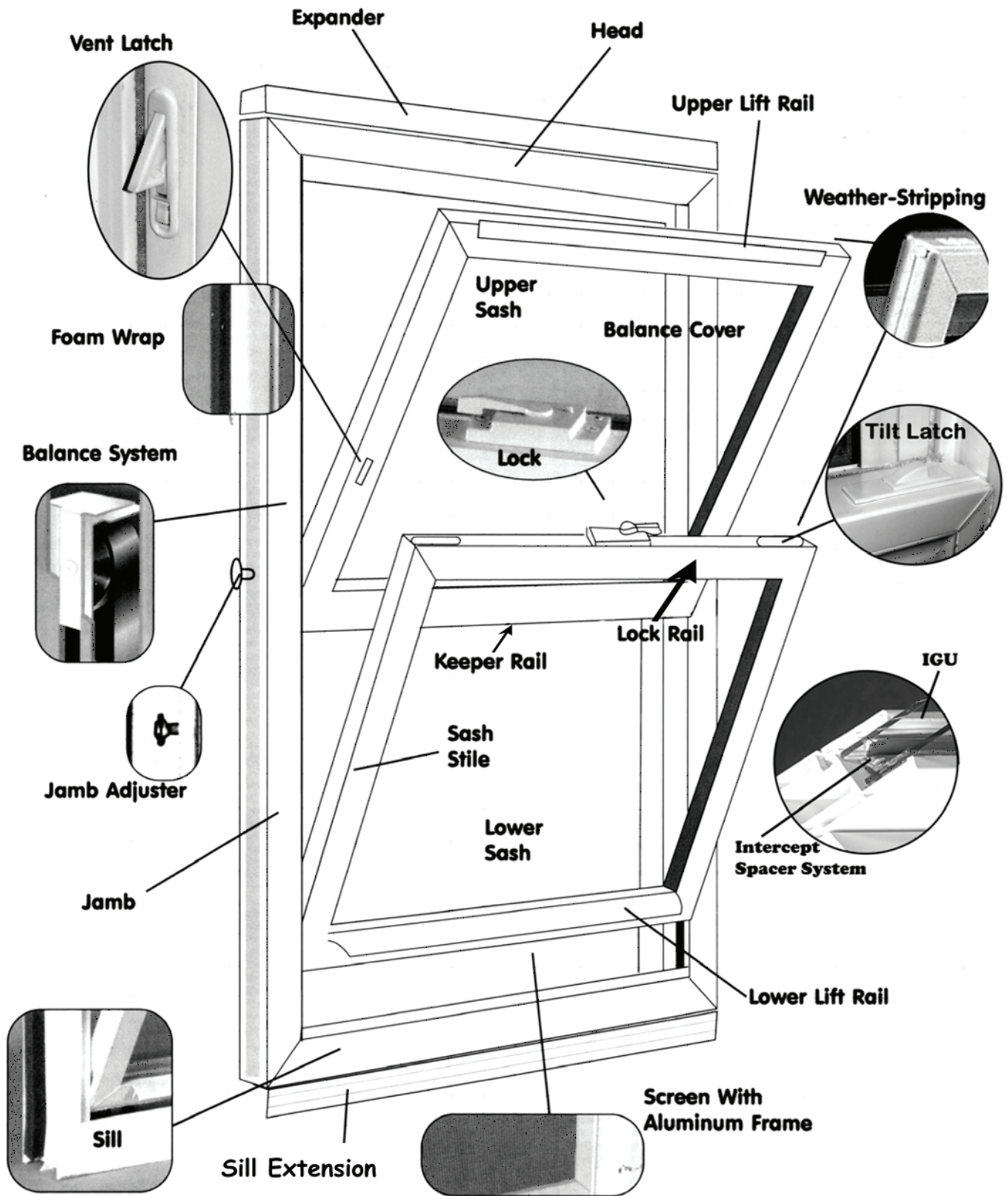




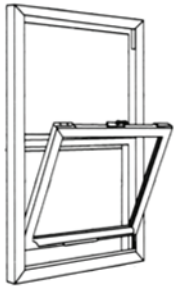
Operation & Maintenance of Aluminum Windows Manual

Crystal[®]
WINDOW & DOOR
Crafted with Passion, Built to Perform™

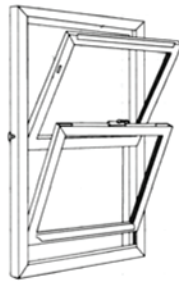
Industry Nomenclature



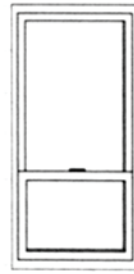
Window diagrams below are outside-looking in, unless indicated otherwise.



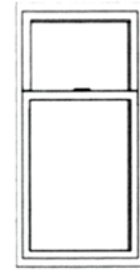
Single Hung



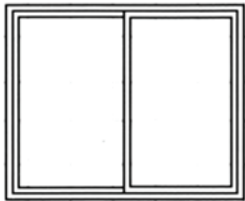
Double Hung



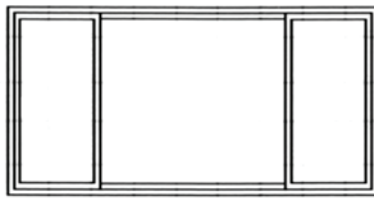
Oriel



Cottage



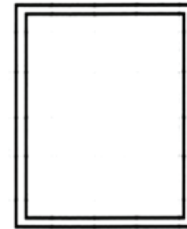
2 Panel Slider



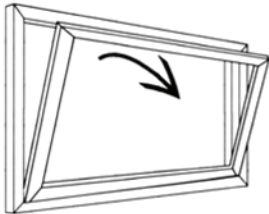
3 Panel Slider



Picture Window



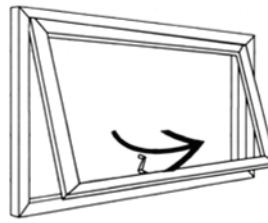
Deadlites
Sash Only



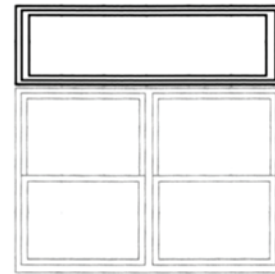
Hopper



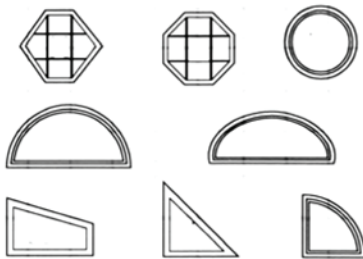
Casement
(outside view)



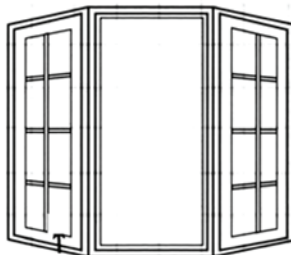
Awning



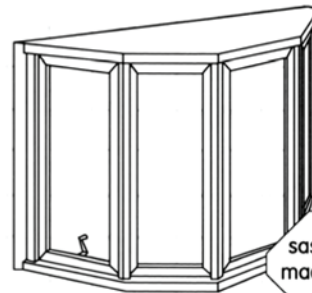
Transoms



Architectural Shapes



Bay



Bow

sashes can be
made to open or
be fixed

Table of Contents

REFERENCE:

| | |
|--|----|
| Industry Nomenclature and Window Types Diagram | 02 |
| Introduction | 06 |

WINDOW TYPES: 07

| | |
|--|----|
| Vertical Hung Windows (Single or Double Hung) | 07 |
| Horizontal Sliding Windows | 07 |
| Fixed Windows | 07 |
| Casement Windows | 08 |
| Projected Windows (Awning or Hopper) | 08 |
| Tilt-and-Turn Windows (Dual Action) | 08 |
| Sliding Patio Doors | 09 |
| Swing Doors | 09 |

NORMAL OPERATION OF WINDOWS AND DOORS: 10

| | |
|---|----|
| Vertical Hung Windows (Single or Double Hung) | 10 |
| Normal Opening and Closing Operation | 10 |
| Sash Lock Operation | 10 |
| Anti-Drift Clip/ Continuous Anti-Drift Clip Operation | 10 |
| Lower and Upper Sash - Tilt Operation | 11 |
| Operable Sash Removal for Windows with Tilt Feature | 12 |
| Tilt Latch Types | 13 |
| Side Load Window - Sash Removal | 14 |
| Horizontal Sliding Windows | 15 |
| Normal Opening and Closing Operation | 15 |
| Sash Lock Operation | 15 |
| Continuous Lock Clip Operation | 16 |
| Operable Sash Removal | 16 |
| Roller Adjust | 17 |
| Fixed Windows | 18 |
| Casement Windows | 18 |
| Normal Opening and Closing Operation | 18 |
| Lock Handle Types and Operation | 19 |
| Crank Operator Operation | 19 |
| Lock Point Adjustment (on vent) | 20 |
| Frame Keeper Adjustment | 20 |
| Projected Windows (Awning or Hopper) | 21 |
| Normal Opening and Closing Operation | 21 |

| | |
|--|-----------|
| Lock Handle Types and Operation | 22 |
| Crank Operator Operation | 23 |
| Tilt-and-Turn Windows (Dual Action) | 24 |
| Normal Opening and Closing Operation | 24 |
| Lock Handle Operation | 25 |
| Keeper Adjustment (in Frame) | 25 |
| Sliding Patio Doors | 26 |
| Normal Opening and Closing Operation | 26 |
| Latch Lock Operation | 26 |
| Roller Adjustment | 26 |
| Swing Doors | 27 |
| Normal Opening and Closing Operation | 27 |
| Lock and Handle Operation | 27 |
| Locking Point Adjustment (on door dash) | 28 |
| Keeper Adjustment (in frame) | 28 |
| NORMAL OPERATION OF WINDOWS AND DOORS SCREENS: | 30 |
| Types of Screens | 30 |
| Normal Opening and Closing Operation | 31 |
| Screen Removal and Reinstallation | 32 |
| WINDOW LIMITING DEVICES: | 36 |
| Window Limiting Devices available by Window Types | 36 |
| CLEANING AND MAINTENANCE OF WINDOW AND DOOR: | 38 |
| General Cleaning of Windows and Doors | 38 |
| Tilting and Removing Window Sashes to Clean Exterior Surfaces | 38 |
| General Cleaning of Window and Door Screens | 39 |
| WINDOW AND DOOR WATER DRAINAGE SYSTEMS: | 40 |
| Types of Drainage Systems | 40 |
| Maintenance of Drainage | 41 |
| CONDENSATION, HUMIDITY AND TEMPERATURE: | 42 |
| How Condensation Forms on Window and Door Surfaces | 42 |
| How Crystal Products can Reduce Condensation | 43 |

Introduction

Congratulations, and thank you for your selection of a Crystal Windows & Door Systems, Ltd. Product. All of our products have been engineered and manufactured to the highest standards. Our products have been rigorously tested by certified third-party laboratories to assure that they perform as designed for years to come. Our products are backed by a limited warranty. To ensure that they work as designed, our products will require periodic maintenance to ensure good performance for years.

There are a few elements involved in the operation and maintenance of windows and doors, including:

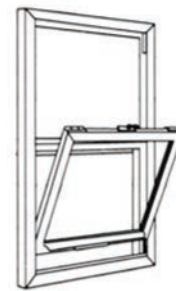
- The normal operation of window and door components
- The normal operation of window and door screens
- Cleaning and maintaining windows, doors, and screens
- Maintaining the water drainage systems
- Understanding how condensation forms, and how to reduce condensation conditions
- Troubleshooting any problems that may arise

Window and Door Types

Crystal Windows & Doors offers various types of window and door products to suit your needs.

Vertical Hung Windows (Single or Double Hung)

- Vertical Hung windows feature operating sashes sliding in a vertical direction along the jambs.
- Double Hung windows have two operating sashes.



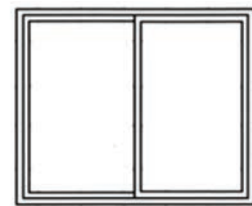
Single Hung



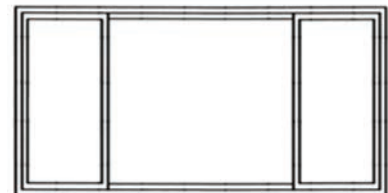
Double Hung

Horizontal Sliding Windows

- Horizontal Sliding windows feature operating sashes or lites sliding in a horizontal direction along the header and sill.
- Horizontal sliding windows are available in 2-lite or 3-lite configurations.
- 2-lite horizontal sliding windows may be available in the following configuration:
 - Two operating sashes
- 3-lite horizontal sliding windows may be available in the following configurations:
 - Two fixed end sashes, one operating middle sash.
 - Two operating end sashes, one fixed middle sash.
 - Three operable sashes.



2 Panel Slider



3 Panel Slider

Fixed/Picture Windows

- Fixed windows have non-operating sashes and fixed glazing.

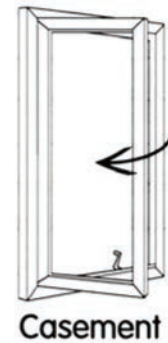


Picture Window

Window and Door Types

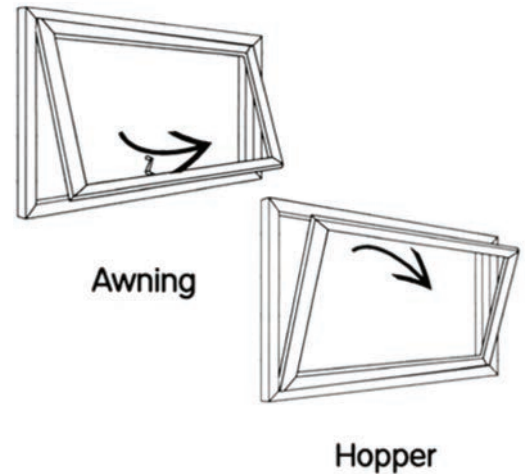
Casement Windows

- Casement windows have a vent that can swing inward or outward.
- Casement windows have concealed hinges located at left or right sides at the top and bottom corner.



Projected Windows (Awning or Hopper)

- Projected windows have a vent that swings open either inward and downward (Hopper windows), or outward and upward (Awning windows)
- Hopper windows have concealed hinges located along both jambs near the bottom sill.
- Awning windows have concealed hinges located along both jambs near the top header.



Tilt-and-Turn Windows (Dual Action)

- Tilt and Turn windows have a vent that can open in-ward in two different ways.
- These windows feature a few types of hinges:
 - Concealed tilt arm located at the head
 - Concealed locking point and hinge located at the sill.
 - Exposed or concealed hinges located along one of the jambs.
- The concealed tilt arm at the head works in conjunction with the lock point and hinges at the sill to allow the vent to operate as a tilt hopper window. The lock point provides a pivot point for the vent, while the tilt arm holds the open vent in place to allow indoor ventilation.
- The hinges on the jamb allows the vent to open as an in-swing casement window.
- The window handle operates the way that the vent can be opened.



Window and Door Types

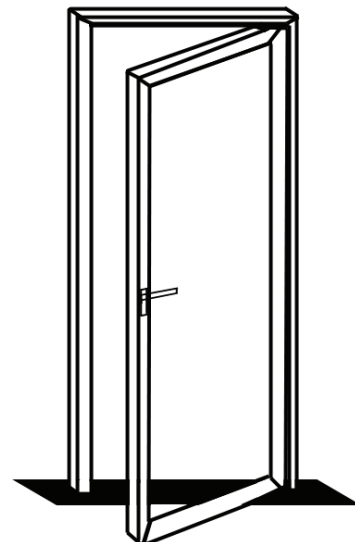
Sliding Patio Doors

- Sliding Patio Doors are glazed doors that slide open and closed on adjustable tandem rollers along a track on the bottom sill.
- Sliding Patio Doors are available in 2-lite or 3-lite configurations.
- 2-lite Sliding Patio Doors are available only in one operating sash, one fixed sash configuration.
- 3-lite Sliding Patio Doors are available only in one operating middle sash, two fixed end sashes configuration.



Swing Doors

- Swing doors are glazed doors that swing open on hinges located on a side jamb.
- Swing doors can swing either inward or outwards, depending on the model.
- Swing doors can be hinged on the left or right.



Normal Operation of Windows & Doors

This Section goes over the following topics:

- How to open and close window or door product.
- How to lock and unlock your window or door product.
- How to tilt or remove window sashes/vents to allow easier cleaning and maintenance.
- How to adjust hardware to ensure your window or door product opens and closes properly.

1. Vertical Hung Windows

i. Normal Opening and Closing Operation

Double hung windows have two operable sashes (lower & upper).

To open and close lower sash:

- Lift the sash upwards using lower lift rail to open.
- Slide the sash downwards to close.

To open and close the upper sash:

- Slide the sash downwards using the upper lift rail.
- Lift the sash upwards to close



ii. Sash Lock Operation

Sash locks prevent the window from opening when both sashes are closed. Each lock consists of a sash lock cam on the lower sash and sash lock keeper on the upper sash. Windows can have one or multiple sash locks depending on sash width.

To unlock the sash locks:

- Flip all sash lock cams to the right, The window is now unlocked.



Unlocked

To lock the sash locks:

- Close both sashes to align the sash lock cams and keepers
- Flip the sash lock Cams to the left to engage their keepers. The window is now locked.



Locked

iii. Anti-Drift Clip & Continuous Anti-Drift/Lock Clip Operation

All aluminum double hung windows have an anti-drift or continuous anti-drift on the upper sash. The clip prevents the upper sash from sliding downward due to its weight.

Some aluminum double hung (DH) windows feature a continuous lock clip on the lower sash. Windows with a continuous clip on the lower sash do not require a separate sash lock, since both clips will lock the window when the two sashes are closed.

To operate the lower sash:

- Tilt the clip upwards to unlock the sash.
- Slide the sash upward while keeping the clip tilted
- The clip can be released once it passes the frame locking point. The sash can slide freely now.
- Slide the sash back down to close and lock it. The clip automatically locks with the frame when it slides past the locking point and makes an audible click sound.



To operate the upper sash:

- Tilt the clip downwards to unlock the sash.
- Slide the sash downward while keeping the clip tilted
- The clip can be released once it passes the frame locking point. The sash can slide freely now.
- Slide the sash back up to close and lock it. The clip locks with the frame when it slides past the frame locking point and makes an audible click sound.



iv. Lower and Upper Sash - Tilt Operation

Tilt double hung windows have operable lower and upper sashes that can be tilted inwards to provide access for cleaning exterior sash surfaces.

Each operable sash connects to the frame through tilt latches at the top rail and pivot bars at the lower rail. Tilt latches engage with the frame jamb on both sides. Pivot bars engage with pivot lock shoes, which are connected to balances inside both jambs.

The Lower sash must be tilt first and remain tilted before the upper sash can be tilted. When tilting the sashes back up, the upper sash must be tilted back up first before the lower sash.

To tilt the lower sash:

- Lift the sash a few inches above the sill.
- Unlatch the tilt latches by pushing both latches towards the center.
- Tilt the sash inwards along a flat plane (pivot lock shoes at the same height). Tilting the sash on an angled plane can damage tilt mechanisms.



- To put back the sash, tilt it upwards until both tilt latches snap back into the jambs. You should hear an audible click on both sides.

To tilt the upper sash:

- Make sure the lower sash remains tilted.
- Lower the upper sash a few inches below the head.
- Unlatch the tilt latches by pushing both latches towards the center.
- Tilt the sash inwards along a flat plan (pivot lock shoes at the same height. Tilting the sash at an angled plane can damage the tilt mechanisms.
- To put back the sash, tilt it upwards until both tilt latches snap back into the jambs. You should hear an audible click on both sides.



v. Removing Operable Sashes for Hung Windows with Tilt Feature

The lower sash must be removed first before the upper sash can be removed.

After removal, the upper sash must be reinstalled first before the lower sash can be reinstalled.

To remove a sash:

- Unlatch the tilt latches on the upper rail and tilt the sash slightly.
- For the lower sash, raise it up the head.
- For the upper sash, lower the sash a few inches below the head.
- Use a Philips - head screwdriver to partly loosen the screw the pivot bar on one side just enough the allow the bar to slide. The pivot bars are located at the bottom of the lower rail on both sides.
- Slide the loosened pivot bar towards the center of the sash to remove from its pivot lock shoe.
- Angle this side with removed pivot bar out of the frame and towards the interior. Remove the sash by pulling away from the other side to remove the other pivot bar from its lock shoe.
- Make sure the loosened pivot bar remains inside the sash for later installation. You may temporarily tighten the screw to prevent misplacing the pivot bar.



To reinstall a sash:

- Grasp the removed sash by its sides. Reinstall the last side that was removed first.
- Angle the sash to slide the pivot bar into its pivot lock shoe. The sash should be in the same slightly-tilted position it was removed in.
- Align the other pivot bar with its pivot lock shoe, and then slide the loosened pivot bar back into its pivot lock shoe.
- Tilt the sash back into the frame, making sure both tilt latches snap back into the jambs.
- Use a Philips - head screwdriver to retighten the loosened pivot bar.



vi. Tilt Latch Types

For tile hung windows, there are three types of tilt latches available:

- Standard Tilt latch with tri-wing lock
- Custodial tilt latch with recessed screws

a. Standard Latch with Tri-Wing lock

To unlatch the standard tilt latch , place a finger inside the hole of each latch. Then push both latches towards the center.

This is a standard tilt latch with an additional tri-wing screw lock to prevent unauthorized use.

To lock and unlock :

- Use a tri-wing screwdriver matching the tri-wing screw heads.
- The latch is locked when the “lock” arrows are aligned.
- To unlock, use the screwdriver to turn the screw 180° on both latches so that the “lock” arrows are not aligned.
- To lock, turn the screws to realign the ”lock” arrows.



b. Custodial Tilt Latch with Recessed Screws

This latch features recessed screws to prevent unauthorized use.

To unlock, operate, and lock this latch:

- Lift and turn the snap covers inwards to access the recessed screws.
- Use a Torx Screwdriver matching the recessed screw heads to turn the recessed screws until their heads rise just above the opening.
Do not unscrew the screws completely.
- Place your fingers on both snap covers to slide the latch towards center to unlatch the sash.
- When in the sash is tiled back into the frame, lock both latches by turning both screws until they are in recessed position again. Swing both snap covers back to their original position.



vii. Removing Sashes from Side Load Hung Windows

Side load hung windows feature unique block-and-tackle balances and take-out clips that allow one or both sashes to be completely removed for maintenance and cleaning purposes.

The lower sash must be removed before the upper sash can be removed.

The upper Sash must be reinstalled before the lower sash can be reinstalled.

To remove a sash:

- Remove any sash stops or obstructions from both jambs that prevents the sash from being raised past the take-out clips.
- The take-put clips are normally flush to the jambs.
- To remove a sash, flip both take-out clips out diagonal to the jambs.
- Raise the sash to allow the right side to catch and hold the block-and-tackle balance. The clips will hold the balances until the sash is reinstalled.
- Sliding the sash into left jamb to allow the right side of the sash to slide out of the right jamb.
- Angle the right side of the sash towards the interior.
- With the sash angled out of the window, remove the sash by sliding it the right to remove the left side of the sash from the left jamb.

To reinstall a sash:

- Angle the sash to install the left side into the left jamb first. Push the left side deep into the left jamb.
- Tilt the right side into the frame. Slide the right side of the sash into the right jamb.



To reinstall a sash (Continue):

- Align and center the sash on the window frame.
Carefully lower the sash on to the block-and-tackle balances that are held by the take-out clips.
- Lower the sash until the take-out clips are exposed.
- Push the take-out clips back flush into the jambs.

2. Horizontal Sliding Windows

i. Normal Opening and Closing Operation

Horizontal sliding windows are available in 2-lite or 3-lite configurations with different combinations of operable and fixed sashes.

To open an operable sash:

- Unlock the sash lock or clip.
- Slide the sash sideways to open using the sash pull.

To close an operable sash:

- Slide the sash back towards the jamb or adjacent sash to close using the sash pull.



ii. Sash Lock Operation

Sash locks prevent the window from opening when closed. Each lock consists of a sash lock cam on the operable sash and a sash lock keeper on the adjacent sash. Horizontal sliding windows can have one or multiple sash locks depending on the sash height.

To unlock a sash lock:

- Flip all sash lock cams perpendicular (pointing inwards) to the sash stile. the sash is not unlocked.

To lock a sash lock:

- Close both sashes to align the sash lock cams and keepers.
- Flip the sash lock cam(s) parallel with the keeper stile. Ensure the lock cams engage their sash lock keepers. The window is now locked.



iii. Continuous Lock Clip Operation (Auto Lock Option)

Continuous lock clips are located on the sash pull of each operable sash and serves as the lock for each operable sash.

To unlock a continuous lock:

- Tilt the clip sideways towards the opening direction.
- Keep the clip tilted until it passes the frame locking point. The sash is now unlocked.

To lock a continuous lock:

- Slide the sash closed.
- The clip automatically locks with frame when it slides past the frame locking point and makes an audible click sound.



iv. Operable Sash Removal

Operable sashes can be removed for cleaning and maintenance.

- Interior sash must be removed first before the exterior sash can be removed.
- Exterior sash must be reinstalled first before the interior sash can be reinstalled.

An anti-lift block is installed in the top track at each closed position. It prevents the sash from being removed from the outside when the sash is closed and locked.

Sash stops may be installed towards one end of the top and bottom track to prevent the operable sash from sliding past the anti-lift blocks.

To remove an operable sash:

- Remove any sash stops from the top and bottom tracks.
- Slide the sash open past the anti-lift block in the top track.
- Grasp the left and right sash stiles to lift the sash out of the bottom track and further up into the top track.

To remove an operable sash: (continuous)

- Angle the bottom of the sash inwards and out of the frame.
- Pull the sash downward to remove it from the top track. The sash is now removed.
- Place the sash on a soft, secure surface away from foot traffic.

To re-install an operable sash:

- Reinstall the sash at the same position it was removed in.
- Grasp the sash by its left and right stiles.
- Angle the top of the sash towards the outside. Insert the top of sash deep into the top track.
- Angle the bottom of the sash into the window frame. Align the sash with the bottom track before carefully lowering the sash on to the track.
- Slide window side-to-side to ensure its sitting and sliding on the bottom track correctly.



v. Operable Sash Roller Adjustments

The height of operable sashes can be adjusted through the rollers. The rollers housing have slots for two (2) different roller heights, and the height difference is $\frac{1}{16}$ ".

To perform the height adjustments:

- Remove the operable sash and flip it 180° so have the bottom rail at the top.
- Note the empty slots in the housing. The rollers will be placed into these slots.
- Use a screwdriver to pry off the rollers from their current slots.
- Place the rollers into their new slots. Use a rubber mallet to gently but firmly hit the rollers so that they sit into their new slots.
- Reinstall the sash back into the frame.



NOTE: It is advised to install all rollers in housing corresponding to the same height.

3. Fixed/Picture Windows

Fixed/Picture windows cannot be opened, and remain permanently closed.



4. Casement Windows

i. Normal Opening and Closing Operation

Casement windows are hinged either on the left or right. Based on the window series, the vents open either inwards or outwards (in-swing or out-swing).

Lock handles are used to lock and unlock the window vent. The lock handle is located either on the vent or frame, depending on the window series. Some windows are available with special locks that can only be opened with a key or special tool.

To open a casement window:

- Unlock the lock handle.
- Push or pull the vent open using the vent lock handle or vent pull rail.

To close a casement window:

- Make sure the lock handle is unlocked.
- Push or Pull the vent to closed using the vent lock handle or vent pull rail.
- once the vent is closed, lock the window using the lock handle.



A crank operator is available for some outswing casement windows. It allows users to open and close the vent without physically pushing and pulling the vent. This option provides ADA-compatible accessibility to allow easier opening and closing operation.

ii. Lock Handle Types and Operation

a. Frame Lock Handle

A frame lock handle operates a sliding lock along the frame that engages locking points along the vent.

To unlock the vent:

- The frame lock handle points downward in locked position.
- To unlock, flip the lock handle up as far as it goes.



To lock the vent:

- Close the vent completely.
- Flip the lock handle down all the way. Push or pull the vent to ensure it is locked and secured.

b. Vent Lock Handle

A vent lock handle operates a sliding lock along the side of the vent that engages multiple locking points along the jamb.

To unlock the vent:

- The vent lock handle points downwards in lock position.
- To unlock, turn the lock handle 90° pointing towards the center of the vent.



To lock the vent:

- Close the vent completely.
- Turn the lock handle to point downwards. Pull or push the vent to ensure it is locked and secured.

iii. Crank Operator Operation

Crank operators may be installed at the sill frame near the hinge side of out-swings windows to allow users to open and close the vent without physically pushing or pulling the vent.

To open a window with a crank operator:

- Unlock the window.
- Turn the crank counter-clockwise until the vent opens to the desired position.

To close a window with a crank operator:

- Turn the crank clockwise until the vent is closed completely.
- Lock the window.



iv. Locking Point Adjustment (on vent)

Locking points on the vent can be adjusted two ways to provide varying vent compression levels when the window is closed and locked:

- Tighter if the user desires a tighter and more airtight window.
- Looser if the user desires a window vent that is easier to open.

To adjust the locking points:

- Locking points are located on the side of the frame jamb or the vent.
- Use an appropriately-sized hex wrench (verify size in field) to adjust the locking points.
- To adjust for higher vent compression, turn the locking point so the divot points outside (for vent locking points) or inside (for frame locking points).
- To adjust for looser vent compression, turn the locking point so that the divots points inside (for vent locking points) or outside (for frame locking points).
- Vent compression can be customized between the tightest and loosest adjustment points.



Locking point adjustment is the default method to adjust vent compression. If additional vent compression adjustment is desired, refer to the next section “Frame Keeper Adjustment”.

NOTE: Not all casement windows have frame keeper adjustment available.

v. Frame Keeper Adjustment

If available, frame keeper can be adjusted to different height positions and to provide varying vent compression levels.

Individual frame keepers must be at the correct height to engage with their corresponding vent locking point.

To adjust the keeper's height:

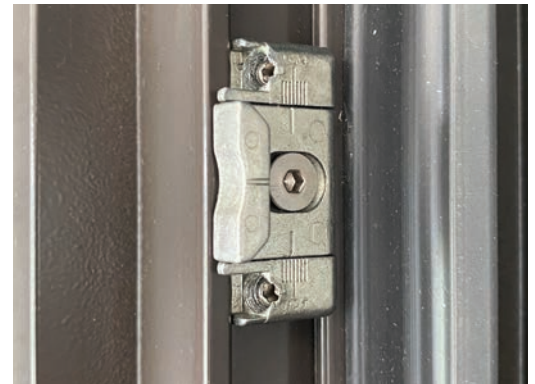
- Use an appropriately-sized hex wrench (verify size in field).
- Turn the diagonal screws counterclockwise to release the keeper.
- Slide the keeper to the correct height to cleanly engage with the vent locking points when the window is closed and locked.
- Once the keeper is at correct height, tighten both screws clockwise until snug.



Individual Keepers can be adjusted to provide varying vent compression levels when the window is closed and locked.

To adjust the vent compression:

- Use an appropriately- sized hex wrench (verify size in field).
- Turn center screw of the keeper counter-clockwise to loosen the vent compression adjustment.
- To tighten the compression, slide the keeper towards the outside.
- To relax the compression, slide the keeper towards the inside.
- Once the vent compression is satisfactory, tighten the center screw clockwise until snug.



5. Projected Windows (In-swing Hopper, Out-swing Awning)

i. Normal Opening and Closing Operation

Projected windows are available as awning or hopper windows. Awning windows open outwards and are hinged near the top. Hopper windows open inwards and are hinged near the bottom.

Locked handles are used to lock and unlock the window vent. The lock handle(s) is located either on the vent or on the frame, depending on the window series.

To open a projected window:

- Unlock the lock handles.
- Push or pull the vent open using the vent lock handle or vent pull rail.

To close a projected window:

- Make sure the lock handles are unlocked.
- Push or pull the vent to closed using the vent lock handle or vent pull rail.
- Once the vent is closed, lock the window using lock handles



A crank operator is available for some out-swing awning windows. It allows users to open and close the vent without physically pushing or pulling the vent. This option provides ADA-compatible accessibility to allow easier opening and closing operation.

ii. Lock Handle Types and Operation

a. Frame Lock Handle (sliding lock)

A Frame lock handle operates a sliding lock along the jamb that engages locking points on the vent. Frame lock handles are located on both sides of a projected window vent, and both lock handles must be unlocked to open the window.

To unlock the vent:

- The frame lock handle points downward in locked position.
- To unlock, flip the lock handles up as far as they go.



To lock the vent:

- Close the vent completely
- Flip the lock handles down all the way. Push or pull the vent to ensure it is locked and secured.

b. Vent Lock Handle

Vent lock handle operates a sliding lock along the bottom of the vent that engages multiple locking points along the sill. This lock handle is available for select hopper windows.

To unlock the vent:

- The vent lock handle point sideways in locked position.
- To unlock, turn the lock handle 90° pointing up towards the center of the vent.



To lock the vent:

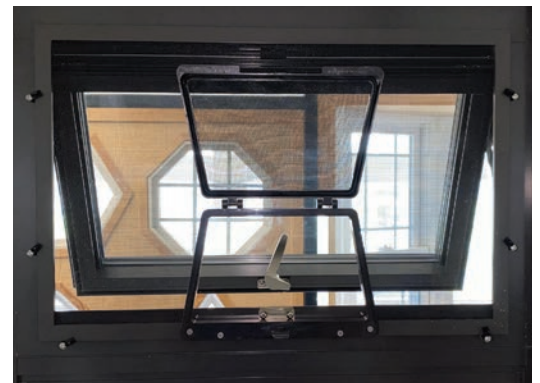
- Close the vent completely.
- Turn the lock handle to point sideways. Pull or push the vent to ensure it is locked and secured.

c. Vent Lock Handle (cam lock)

Vent lock handle operates a cam that engages with frame keeper. the cam and keeper mechanism is located either outside the frame or inside the frame.

To unlock the vent:

- The lock handle points sideways when it is in locked position.
- To unlock, turn the lock handle 90° pointing up/down towards the center of the vent.



To lock the vent:

- Close the vent completely.
- Turn the lock handle to point sideways. Pull or push the vent to ensure it is locked and secured.

iii. Crank Operator Operation

Crank operators may be installed at the sill frame near the hinge of out-swing hopper windows to allow users to open and close the vent without physically pushing or pulling the vent.

To open a window with a crank operator:

- Unlock the window.
- Turn the crank counter-clockwise until the vent opens to the desired position.



To close a window with a crank operator:

- Turn the crank clockwise until the vent is closed completely.
- Lock the window.



6. Tilt-and-Turn Windows (Dual Action)

i. Normal Opening and Closing Operation

Tilt-and-Turn can be opened either as an in-swing casement window or project-in tilt window using the lock handle, and can be hinged on the left or right.

To open the window:

- Unlock the window by turning the lock handle to the desired window types (see “Operation of lock handle”).
- Pull the vent open using the lock handle.
- To switch to another window operation type, close the vent before turning the lock handle to the next desired window operation type.

To close the window:

- Push the window closed using the lock handle.
- Turn the lock handle to locked position.



ii. Lock Handle Operation

The window lock handle locks the window when it is closed and operates how the vent opens.

To unlock the window:

- The lock handle is pointing downwards when the window is closed and locked.
- To unlocked, turn the lock handle to the desired operation either at 90° or 180° position.

To lock the window with the lock handle:

- Make sure the vent is closed.
- Turn the lock handle to point downward. Pull the vent to ensure that it is locked and secured.



To open the Window in two different ways:

- The way window opens with the lock handle at 90° and 180° differs for each Tilt-and-Turn window series.
- Turn the lock handle 90° (pointing sideways) to open the window either as a casement window or project-in tilt window.
- Turn the lock 180° (pointing up) to open the window either as a casement window or project-in tilt window.
- The window must be closed before the lock handle can be turned to a different position.



iii. Frame Keeper Adjustment

If available, frame keepers can be adjusted to different height positions and to provide varying vent compression levels.

Individual frame keepers must be at the correct height to engage with their corresponding vent lock point.

To adjust the keeper's height:

- Use an appropriately-sized hex wrench (verifying size in field).
- Turn the two diagonal screws Counter clockwise to release the keeper.
- Slide the keeper to the correct height, tighten both screws clockwise until snug.
- Once the keeper is at the correct height, tighten both screws clockwise until snug.



Individual keepers can be adjusted to provide varying vent compression levels when the window is closed and locked.

To adjust the vent compression:

- Use an appropriately-sized hex wrench (verifying size in field).
- Turn center screw of the keeper counter-clockwise to loosen the vent compression adjustment.
- To tighten the compression, slide the keeper towards the inside.
- To relax the compression, slide the keeper towards the outside.
- Once the vent compression is satisfactory, tighten the center screw clockwise until snug.



7. Sliding Patio Doors

i. Normal Opening and Closing Operation

Sliding Patio Doors are available in 2 or 3 - panel configurations with different configurations with different combinations of operable and fixed panels. In all configuration, there is at least one fixed panel and one operable panel.

To open an operable panel:

- Slide the operable panel open using the pull handle.
Use the rail on the meeting stile to assist with sliding the door open.

To close an operable panel:

- Use the pull handle and/or pull rail to slide the operable panel back towards the door jamb or adjacent fixed panel.



ii. Latch Lock Operation

The latch lock prevents unauthorized access from outside. The lock lever for the latch lock is located on the pull handle of the operable panel.

To unlock an operable panel:

- Flip the lock lever up to release the lock. The door panel can now slide open.

To lock an operable panel:

- Slide the door closed. Ensure the lock mechanism can latch with the keeper in the jamb or adjacent sash.
- Flip the lock lever down to engage the lock. The door panel is now locked.



Some sliding doors feature a safety mechanism to prevent users from turning the door lock when the door is open to prevent accidental damage to the lock.

iii. Door Height Adjustments

The height of sliding patio doors can be modified (if necessary) by adjusting the rollers on each end of the door. Each end has a height adjustment screw that controls the height of the door.

To raise and lower the rollers an operable panel:

- Use a correct-sized Phillips head screw driver to perform adjustments.
- Turn the adjustment screw clockwise to raise the door.
- Turn the adjustment screw counter-clockwise to lower the door.
- After adjusting the door to a satisfactory height, make sure the door is plumb and level.
- Slide the door until it almost closed, leaving a slight gap between the door and adjacent jamb/sash.
- Measuring the gap at the top, middle, and bottom. If there is a noticeable variation between the top and bottom gap measurements, adjust the height adjustments until the gap measurements are the same.



8. Swing Terrace Doors

i. Normal Opening and Closing Operation

Swing doors are available in one or two door configurations. One door configurations are available with a small transom window on top. Swing doors can be hinged on the left or right, and available either as in-swing or out-wing doors

To open a swing door:

- Push down to turn the door handle.
- Push or pull the door open using the door handle.
- Swing doors can be opened a maximum of 90°.

To close a swing door:

- Push or pull the door closed using the door handle
- Once the door is closed, push and pull the door to ensure it has latched shut.



ii. Lock and Handle Operation

The locks on a swing door consist of two parts:

- A sliding lock along the door panel which engages multiple lock points along the frame jamb. The sliding lock is operated by the door handle.
- A deadbolt lock which engages the deadbolt keeper in the jamb. The deadbolt lock is operated by the thumb turn.

To unlock the swing door:

- Turn the thumb turn diagonal to unlock the deadbolt lock.
- Push Down on the door handle to unlock the sliding lock. The door is now unlocked.

To unlock the swing door:

- Close the door.
- Lift door handle upwards to engage the sliding lock.
- Turn the thumb turn parallel to the floor to engage the deadbolt lock. The door is now locked.



Swing doors feature a safety mechanism feature to prevent users from turning the locks when the door is open. This prevents accidental damage to the locks.

iii. Locking Point Adjustment (on door sash)

Locking points on the door sash can be adjusted two ways to provide varying door compression levels when the door is closed and locked:

- Tighter if the user desires either a tighter and more air tight door.
- Looser if the user desires a door that is easier to open.

To adjust the locking points:

- Locking points are located either on the side or on the side of the vent.
- use an appropriately-sized hex wrench (verify size in field).
- To adjust for tighter door compression, turn the locking point so that the divot points outside for out-swing doors or outside for in-swing doors.



- To adjust for loose door compression, turn the locking point so that the divots point inside for out-swing doors or outside for in-swing doors.
- Door compression can be customized between the tightest and loosest adjustment points.

Performing locking point adjustments is the default method to adjust door compression. If additional door compression adjustment is desired, refer to the next section “Frame keeper Adjustment”.

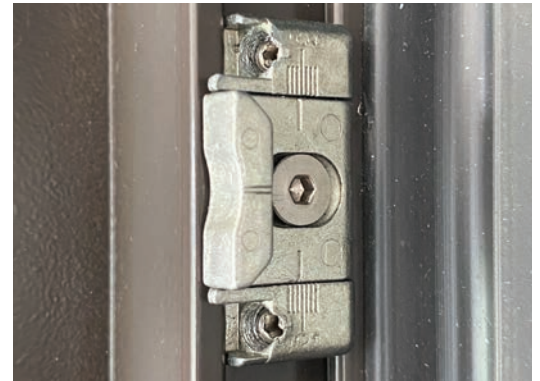
iv. Frame Keeper Adjustment

Frame keepers can be adjusted to different height positions and to provide varying door compression levels.

Individual frame to keepers must be at the correct height to engage with their correct height to engage with their corresponding door locking point.

To adjust the keeper’s height :

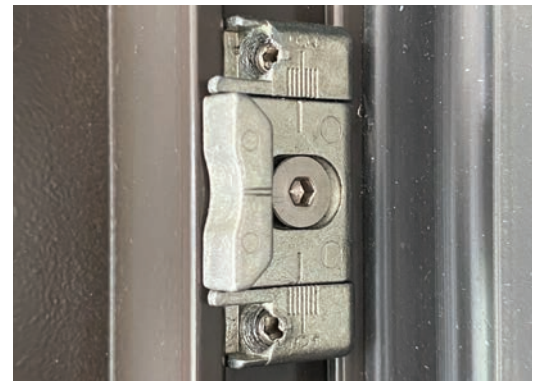
- Use an appropriately-seized hex wrench (verify size in field).
- Turn the two diagonal screws counter-clockwise to release the keeper.
- Slide the keeper to the correct height to cleanly engage with the door locking points when the door is closed and locked.
- Once the keeper is at the correct height, tighten both screws clockwise until snug.



Individual keepers can be adjusted to provide varying door compression levels when the window is closed and locked.

To adjust the vent compression:

- Use an appropriately-seized hex wrench (verify size in field).
- Turn center screw of the keeper counter-clockwise to loosen the door compression adjustment.
- To tighten the compression, slide the keeper towards the outside for in-swing doors, and towards the inside for out-swing doors.
- To relax the compression, slide the keeper towards the inside for the in-swing doors and towards the outside for out-swing doors.
- Once the door compression is deemed satisfactory, tighten the center screw clockwise until snug.



Normal Operation of Windows & Doors Screens

Screens allow a window or sliding door to be opened for ventilation while preventing insects and other pests from entering inside.

NOTE: the screens are not designed as a retaining device for children; refer to the “Window Limiting devices and Window guards” sections.

1. Types of Screens

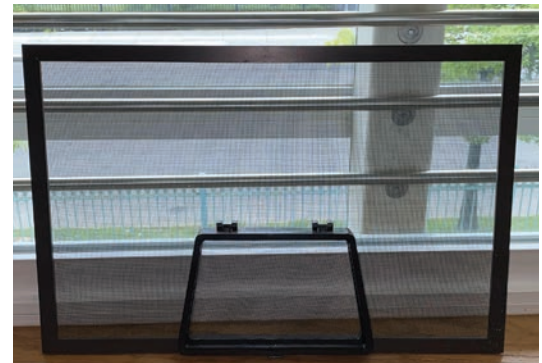
i. Compression Spring Clip Screen

- Compression clip screens, half screens or full screens installed on the following products:
 - Single and double hung windows
 - Horizontal sliding windows
- These screens are held into place on the screen frame by the screen compression clips, which are typically located at the left or top of the screens.
- Half screens can slide up-and-down or sideways to allow users access to the outside.
- Full screens are fixed and cannot be operated.
- Compression Clip screens can be removed and reinstalled for cleaning and maintenance.



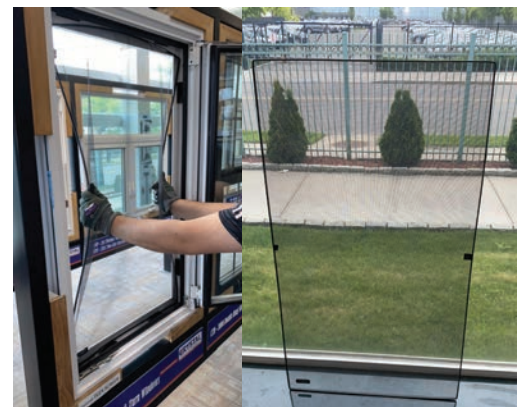
ii. Swivel Clip Screen

- Swivel clip screen are full screens held by multiple swivel clips on the interior or exterior, and are installed on the following select products:
 - Select out-swing casement (at interior)
 - Select out-swing awning windows (at interior)
 - Select in-swing hopper window (at exterior)
- Some swivel clips screens feature a small wicket screen door that opens to allow users to open and close the window vent without needing to remove the screen.
- Swivel clip screens can be removed and reinstalled for cleaning and maintenance.



iii. Flex Screen

- Flex screens are full screens held in place by clips along the inner window frame.
- Flex screens are installed on the following products:
 - Select in-swing casement windows
 - Select tilt-and-turn windows



iii. Flex Screen (Continued)

- Flex screens can be removed and reinstalled for cleaning and maintenance.



iv. Sliding Door Screens

- Sliding door screens are roughly the same width as the operating door sash. They rest on top and bottom screen track frames mounted on the exterior.
- Sliding door screens glide on adjustable spring-mounted rollers installed at the top and bottom rails.
- Sliding door Screens have latch locks to lock the screen door while allowing ventilation indoors.



2. Normal Opening and Closing Operation

i. Compression Clip Screen

- To open a half screen:
 - Screens either have pull rails or pull tabs.
 - To open the half screen, place your fingers in the pull rail or pull tab. Slide the screen up or sideways to your desired position.
- To close a half screen:
 - Place your fingers into pull rail or pull tab. Slide the screen down towards the sill or sideways back to the jamb to close it.



ii. Swivel Clip Screen

- To open a wicket screen door:
 - The wicket screen door is held shut by plastic clip.
 - Press the clip sideways to unlock the wicket screen door.
 - Pull the door open. The user can reach in to push the vent open or pull it closed.
- To close a wicket screen door:
 - Close the wicket screen door. The door is locked when the plastic clip snaps.



iii. Sliding Door Screen

- To unlock and open a sliding door screens:
 - Lift up the latch lock to unlock the screen door.
 - Slide the screen door away from the jamb or adjacent sash using the screen pull.
- To close and lock a sliding door screen:
 - Slide the screen door closed, making sure to align latch lock with latch keeper.
 - Push down the latch lock to lock the sliding door screen.



iv. FlexScreen

- FlexScreen are full screens and cannot be operated.

3. Screen Removal and Reinstallation Guide

Screen can be removed to facilitate cleaning and maintenance, or to be stored away. Window limiting devices and window guards must be first removed before the screen can be removed. Screens can be reinstalled after cleaning or storage.

i. Compression Clip Screen

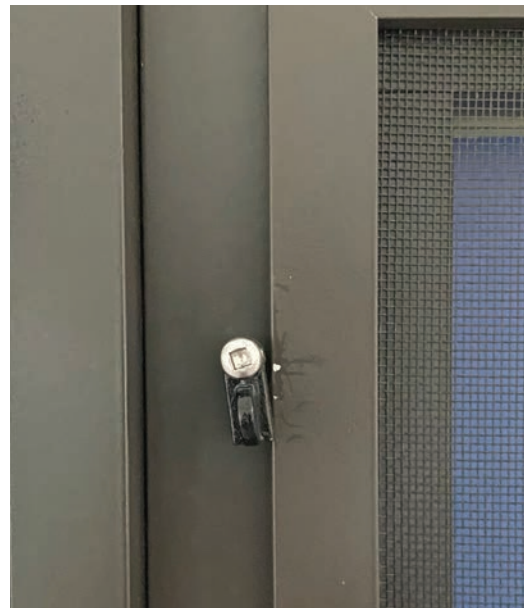
- To remove a compression clip screen:
 - Open the window sash as wide as possible.
 - Press the screen into the screen compression clips to free one side of the screen from the screen frame pocket.
 - Gently push the free side of the screen outside. grab the screen to prevent it from falling outside.
 - Release the screen from compression clips. Slide the compression clip side of the screen away from the screen frame pocket.
 - The screen is now removed and can be brought inside.
- To reinstall a compression clip screen:
 - Place the compression clip side of the screen into the screen frame pocket.
 - Press the screen into the compression clips to allow the other end of the screen to enter the screen frame pocket.
 - Once both sides of the screen are in the screen frame pocket, release the compression clips.
 - Ensure the screen is straight and sitting in the screen frame properly.



- To reinstall a compression clip screen: (continue..)
 - Make sure half screens can open and close properly.

ii. Swivel Clip Screen

- To release a swivel clip screen:
 - Turn all swivel clips parallel to the screen frame to allow the screen to be released.
 - Remove the screen from the swivel clips.
- To reinstall a swivel clip screen:
 - Make sure all swivel clips remain parallel to the screen frame
 - Place the screen on to the swivel clips.
 - Turn all swivel clips perpendicular to the screen frame.
 - Make sure the screen is straight and sitting on the swivel clips properly.
- Swivel Clips can be tightened or loosened using a screwdriver with the correct-sized square head bit. Do not over tighten the swivel clip.



iii. Sliding Door Screen

- To remove a sliding door screen:
 - Open the screen about halfway .
 - The top and bottom screen rollers may need to be retracted in order to remove.
 - Use a correct-sized Philips Head screwdriver to turn the adjustment screwdriver to turn the adjustment screws to the retract the rollers.
 - Retract the top rollers and attempt to remove the screen (follow steps below). If the screen cannot be removed, retract the bottom rollers as well.
 - Lift the screen further in the top.
 - Once the bottom rollers are no longer on the bottom track, angle the bottom of the screen towards the outside.
 - Pull Down the top of the screen to remove the top rollers from the top track. The screen is now removed.



iii. Sliding Door Screen (Continued...)

- To reinstall a sliding door screen:
 - Lift the screen into the top track. The screen must be lifted deep enough into the top track to allow the bottom of the screen to be installed.
 - Angle the bottom of the screen into the screen frame and on to the bottom track.
 - Lower the screen on the bottom track. Make sure the bottom rollers are sitting on the bottom track, and top rollers are rolling on the top track.
 - Roll the screen to the left and right to make sure the bottom rollers glide smoothly on the bottom track. If the rollers do not glide smoothly, extend them until they do.
 - Turn the adjustment screws counter-clockwise to extend the rollers from the screen.
 - Continue adjusting the roller adjustment screw until the sliding screen door plumb and level.



iv. FlexScreen

- To remove FlexScreen:
 - Fully open the window
 - Gently press the center of the FlexScreen towards the exterior so that the screen side rails start to bulge in.
 - Grasp the center tabs or center of the side rails.
 - Squeeze the FlexScreen up to 6" on both sides towards the center of the screen.
 - With both side rails compressed, lift the FlexScreen to push the top rail deeper into the head and to lift the bottom rail off the sill.
 - Pull the bottom of the flex Screen into the interior.
 - With the screen angled towards the bottom, slide the top of the FlexScreen out the screen clips and out of the window.



iv. FlexScreen (Continued...)

- To reinstall the FlexScreen:
 - Squeeze both side rails of the FlexScreen up to 6" towards the center of screen.
 - While still squeezing the side rails, slide a top corner of the screen into the corresponding top corner of window frame. Then slide the other top corner into the other top corner of the window frame.
 - Continue to keep the side rails squeezed in. Slide one of the bottom corners of the FlexScreen into the corresponding bottom corner of the window. Then slide the other bottom corner into the other bottom corner of the window frame.
 - Release the slide rails. Make sure the FlexScreen is straight and sitting in the window frame properly.



Window Limiting Device, Window Opening Control Devices (WOCDs), and Window Guards

Window limiting devices are designed to prevent a window from opening more than a predetermined distance. As a safety precaution, window limiting devices are installed with Tamperproof Screws to prevent removal of the device.

Window Opening Control Devices (WOCDs) are limiting devices that can be fully opened in case of an emergency without tools. Like normal limit devices, WOCDs prevents a window from opening more than a predetermined distance. However, the main difference is that WOCDs can be released through two separate actions (without the use of tools) to allow the window to be fully opened during emergencies. When the window is closed again, the WOCD automatically re-engaged to prevent the window from opening more than the predetermined distance.

Window guards are accessories installed on a window opening. They act as a barrier to prevent children from accidentally falling out of a window. Crystal does not provide any window guard products.

Crystal provides limiting devices and WOCDs designed for each specific window model.

1. Window Limiting Devices Available by Window Type

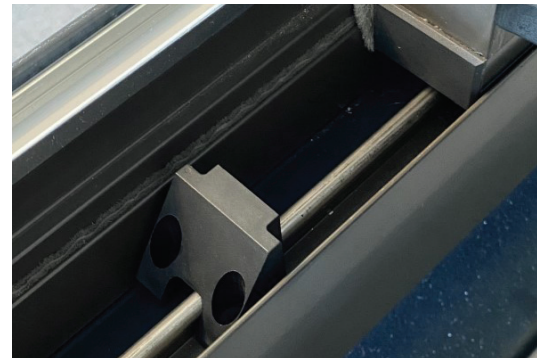
i. Double Hung Windows

- Limiting sash stops are available for both lower and upper sashes, can be installed to provide a customized opening height (4" is recommended for windows accessible by children).
- WOCDs are available for selected series to allow a maximum sash opening of 4".



ii. Horizontal Slider Windows

- Limiting sash stops are available for operable sashes. These can be installed to provide a customized opening width (4" is recommended for windows accessible by children).
- WOCDs are available for selected series to allow a maximum sash opening of 4".



iii. Casement Windows

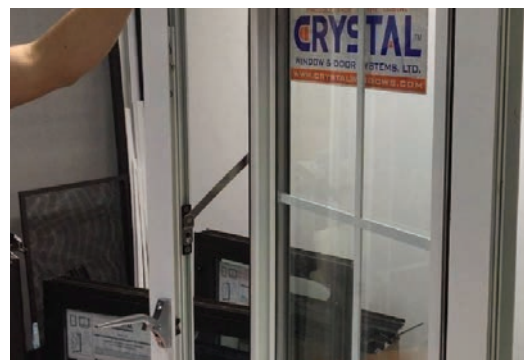
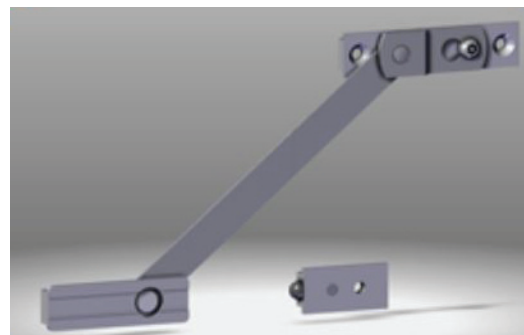
- Limiting arms are installed on the frame and vent to allow a maximum vent opening of 4”.
- WOCDs are available for selected series to allow a maximum sash opening of 4”.

iv. Awning & Hopper Windows

- Limiting arms are installed on the frame and vent to allow a maximum vent opening of 4”.
- WOCDs are available for selected series to allow a maximum sash opening of 4”.

v. Awning & Hopper Windows

- Limiting arms are installed on the frame and vent to allow a maximum vent opening of 4”.



Cleaning and Maintenance of Windows and Doors

Keep your Crystal Window or door product clean in order to extend its lifespan. The build-up of debris and dirt can harm your product, and decrease its durability and ease of use. In most cases, a heavy rain is enough to clean the exterior side of the product. If extra cleaning is required, please refer to the “General Cleaning of Windows and Doors” section below.

1. General Cleaning of Windows and Doors

- Remove any Visible residue from the window/door frames, window sashes/ vents, sliding door lites, and swing door leaves.
- Use a vacuum cleaner to pick up any loose debris.
- After vacuuming, use lukewarm water and a soft damp cloth to gently wash the window and door surfaces.
- Clean in the horizontal direction first, then in the vertical direction.
- Frequently rinse out your cloth to prevent dirt from accumulating and scratching the window or door surfaces.
- To remove tough dirt, apply water to soak the dirt on the surface. Then rinse the detergent and stains away using lukewarm water.
- After washing the window or door, dry it with a clean, soft cloth.
- **CAUTION** - Never use the following items to clean your windows or door products:
 - Liquid grease removers
 - Paint removers
 - Chlorine Bleach
 - Acid
 - Abrasive Cleaners
 - Petroleum-based cleaners or solvents
 - Other harsh chemicals
 - Abrasive pads
 - Razor Blades
- **CAUTION** - Never on sun-heated window or door surfaces. Only clean in shaded areas or areas not exposed to sunlight.
- **CAUTION** - Do not leave masking tape on window or door surfaces. These tapes can become permanently attached and be impossible to remove without damaging the surfaces.

2. Tilting and Removing Window Sashes to Clean Exterior Surfaces

Certain Crystal window products have sashes that can be tilted or removed to facilitate cleaning the exterior surfaces. Refer to “Normal Operations of Windows and Doors” section to determine which products have sashes that can be tilted or removed as well as how to tilt or remove the sashes for these products.

Always make sure to place the tilt or removed sash on a soft stable surface away from foot traffic.

After the exterior surfaces have been cleaned, always install the tilted or removed sashes back into the window frame. Refer to the “Normal Operations of Windows and Doors” section for how to put back sashes.

3. General Cleaning of Window and Door Screens

- To clean in the frame, gently vacuum any loose debris and soil using a brush attachment.
- All screens can be removed for cleaning. Refer to “Normal Operation of Window and Door Screens” section on how to remove screens.
- If screen is removed for cleaning, first use a gentle vacuum to remove any loose debris.
- Place removed screen on a flat clean surface, Vacuum the screen first to remove loose debris/
- Use a mild soap with water and a soft brush to remove additional dirt build-up. Rinse with clean water and use a soft dry cloth to wipe off excess water from the screen and allow it to air-dry.
- Prior to reinstalling a screen, use a vacuum with a soft brush attachment to gently pick up any debris in the screen track.
- Refer to the “Normal Operation of Window and Door Screens” section on how to reinstall screens.
- **CAUTION** - never use the following items to clean your window or door screens:
 - Liquid grease removers
 - Paint removers
 - Chlorine Bleach
 - Acid
 - Abrasive Cleaners
 - Petroleum-based cleaners or solvents
 - Other harsh chemicals
 - Abrasive pads
 - Razor Blades

Window and Door Water Drainage Systems

Crystal window and door products are designed with water drainage systems that provide a way for water to drain outside after it has entered a window or door sill, usually during a rain storm. This helps prevent premature water damage and mold formation within the window frame or wall section of the building.

Different window and door products will have different water drainage systems. Refer to the section below to see which system your product has, and to maintain it.

1. Types of Drainage Systems

There are three general types of water drainage systems available for Crystal Products.

i. Sloped Sill

- A sloped sill is a sill that slopes away from the building interior.
- It is designed to allow water entering the sill to drain away towards outside.
- Sloped sills can be found on the following products:
 - Hung windows



ii. Divided Sloped Sill

- A divided sloped sill is a sloped sill with a short divider along the full width of the sill opening. The divider separates the interior sloped the exterior sloped sill.
- The divider has weep drain holes that allows any water that enters the interior sloped drains into the exterior sloped sill. The water in the exterior sloped sill then drains away towards outside.
- Divide sloped sill can be found on the following products:
 - Hung windows



ii. Pocket Sill

- A pocket sill has a flat sill surface or multiple sill surface that collect any water that enter the sill.
- The water drains from the sill surfaces into a sill pocket below via small drains holes.
- The sill pocket is designed similarly to a sloped sill. It is sloped to drain water towards the outside.
- Water exits the sill pocket and window frame through exterior weep drains.



ii. Pocket Sill (continued...)

- This type of drainage system can be found on the following product:
 - Hung Windows
 - Horizontal Sliding windows
 - Casement Windows
 - Project Windows
 - Tilt-and-Turn Windows
 - Sliding Patio Doors
 - Swing Doors



2. Maintenance of Drainage Systems

i. Window and Door Sills

- Window and door sills should be periodically cleaned of dirt and debris to maintain their water drainage capabilities.
- Refer to the “Cleaning and Maintenance of Window and Door” Section on how to clean sill surfaces.
- Remove any debris that is clogging the drain holes in the sill or sloped sill divider.

ii. Weep Drainage

- Weep drains have hinged plastic covers that help keep the hole free of debris.
- Weep drains should be periodically checked and cleaned of dirt and debris that may be clogging the drains.
- To clean weep drains:
 - Lift up the hinged plastic covers.
 - Use a soft pipe cleaner or bottle brush and gently clear the drain of any dirt and debris.
 - Remove the pipe cleaner or bottle brush from the drain after it has been cleaned.
 - Lower the hinged plastic cover. Ensure that it can open and close in a loose and free manner to allow water to drain freely.



Condensation, Humidity, and Temperature

1. How Condensation Forms on Window and Door Surfaces

Condensation forms when water vapor in the air condenses on a surface with a low enough surface temperature.

There are three ways to represent the amount of water vapors in the air:

i. Relative Humidity

- This is the measured percentage of moisture in the air.
- 100% relative humidity is the maximum amount of water vapor that the air can currently hold before the vapor condenses.
- The term “relative” in relative humidity refers to the fact that the amount of water vapor the air can hold will change relative to the air temperature.
- The amount of water vapor the air can hold will go up as temperature rises. Warm air can hold more water vapor than cool air.

ii. Absolute Humidity

- This the measured weight of water vapor in the air.
- Absolute humidity is measured by the weight of water vapor in a given volume of air.

iii. Dew Point

- This is the temperature at which water vapor condenses from the air based on the current amount of water vapor in the air.
- The Relative humidity at dew point is 100%.
- When there is no precipitation or condensation formation, the current temperature is always higher than the dew point.

Water vapor condenses in the air (precipitation) when the air temperature is the same as the dew point temperature. The amount of water vapor in the air exceeds the amount of water vapor the air can hold at the current temperature, so it condenses into liquid water.

Water vapor can condenses on solid surfaces due to colder surfaces temperatures. The Temperature of a surface is often different from air temperature. If the surface temperature is at or below the dew point temperature of the surrounding air, water vapor in the air will condense on the surface.

Windows can be susceptible to condensation forming on its surfaces. This is because windows are often constructed from materials with high thermal conductivities, such as the aluminum and glass.

Here is an example of how condensation may form on window surfaces:

- Condensation may form on cold winter days. For a single-paned metal-framed window with no thermal breaks, the window transmits the indoor heat to the cold outdoor air. In turn, the cold outdoor air lowers the surface temperature of the window. Because the warm indoor air is generally more humid than the cold outdoor air, the cold interior surfaces may be below the indoor air's dew point, resulting in condensation forming on the interior window surfaces.

Uncontrolled condensation is undesired because it can damage building construction elements and facilitate the formation of mold and mildew.

2. How Crystal Products Can Reduce Condensation

Crystal products have the following features to help prevent the condition at which of condensation forms on the interior window surfaces:

i. Insulated Glazing Units (IGU)

- IGUs can be specified to include Low-E coatings and gas fill (argon and krypton).
- Low-E coatings reflect heat back to the interior to keep the glazing surfaces warm enough to help prevent condensation from forming.
- The gas fill lowers the overall thermal conductivity of the IGU, keeping the interior glazing surfaces warm enough to prevent condensation from forming.

ii. “Warm edge” Stainless Steel and Composite Spacers

- Spacers run along the entire perimeter of an IGU, and separate the panes to form a gas cavity between the panes.
- Stainless steel or composite spacers are both significantly less thermally conductive material than traditional aluminum spacers.
- IGUs with aluminum spacers may have condensation forming near the spacers of the interior glazing surface during cold days.
- Stainless steel or composite spacers help reduce the formation of condensation on the interior glazing surface during cold days.

iii. Aluminum Frames with Thermal Breaks

- Aluminum is a high thermal conductivity material that transfers heat readily. On traditional aluminum windows and doors without thermal breaks, interior surfaces may be freezing on cold days and extremely warm on hot days.
- To reduce the thermal conductivity of aluminum frames, plastic thermal breaks are installed to separate the interior and exterior parts of the aluminum frame.
- Thermal breaks can be installed on aluminum frames, sashes, vents, and doors to reduce the overall thermal conductivity of the product. This helps prevent the conditions at which condensation can develop.

iv. Proper Weather Sealing and Air Sealing

- Proper weather sealing and air sealing helps to prevent uncontrolled air drafts.
- During cold days, uncontrolled air drafts may cool the window/door frame, glass or walls adjacent to any air leaks. This provides condition in which condensation may develop.
- Preventing uncontrolled air drafts helps prevent the formation of condensation.
- Windows and doors should be properly weather-sealed and air sealed within the unit and around the installation area.

◆ NYC, NY (HQ)

31-10 Whitestone Expressway, Flushing, NY 11354
Tel: 800.472.9988/718.961.7300 Fax: 718.460.4594

◆ Scranton, PA

204 Franklin Valley Rd, Dalton, PA 18414
Tel: 570.276.8000 Fax: 570.563.5313

◆ Cleveland, OH

29299 Clemens Rd. 1-B, Westlake, OH 44145
Tel: 440.871.8694 Fax: 440.871.8690

◆ St. Louis, MO

300 Axminister Dr., Fenton, MO 63026
Tel: 636.305.7880 Fax: 636.305.7881

◆ Chicago, IL

1300 W 35th st. Chicago, IL 60609
Tel: 773.376.6688/888.280.3288 Fax: 773.376.6868

◆ Riverside, CA

1850 Atlanta Ave, Riverside, CA 92507
Tel: (951) 779-9300 Fax: (951) 779-6300

◆ Dallas, TX

454 W. Mockingbird Lane, Dallas, TX 75247
Tel: 469.248.3012 Fax: 469.248.2978

◆ Toronto, ON

30 West Pearce Street, Richmond Hill, ON, L4B 1E3
Tel: 905.889.9883 Fax: 905.889.5891

Scan Me:



Crystal Window & Door Affiliations:



Follow us on :

